

Optical and radar measurements of the meteor speed distribution

A.V. Moorhead (1), P.G. Brown (2), M.D. Campbell-Brown (2), A. Kingery (3) W.J. Cooke (1)

(1) NASA Meteoroid Environment Office, Marshall Space Flight Center, Huntsville, Alabama 35812

(althea.moorhead@nasa.gov), (2) Department of Physics and Astronomy, The University of Western Ontario, London

N6A3K7, Canada (3) ERC Inc./Jacobs ESSSA Group, Marshall Space Flight Center, Huntsville, Alabama 35812

The observed meteor speed distribution provides information on the underlying orbital distribution of Earth-intersecting meteoroids. It also affects spacecraft risk assessments; faster meteors do greater damage to spacecraft surfaces. Although radar meteor networks have measured the meteor speed distribution numerous times, the shape of the de-biased speed distribution varies widely from study to study. Optical characterizations of the meteoroid speed distribution are fewer in number, and in some cases the original data is no longer available. Finally, the level of uncertainty in these speed distributions is rarely addressed.

In this work, we present the optical meteor speed distribution extracted from the NASA and SOMN all-sky networks [1, 2] and from the Canadian Automated Meteor Observatory (CAMO) [3]. We also revisit the radar meteor speed distribution observed by the Canadian Meteor Orbit Radar (CMOR) [4]. Together, these data span the range of meteoroid sizes that can pose a threat to spacecraft. In all cases, we present our bias corrections and incorporate the uncertainty in these corrections into uncertainties in our de-biased speed distribution. Finally, we compare the optical and radar meteor speed distributions and discuss the implications for meteoroid environment models.

References

- [1] Cooke, W.J. and Moser, D.E., *Proceedings of the IMC*, Sibiu, pp. 9-12, 2001.
- [2] Weryk R.J., Brown, P.G., Domokos, A., Edwards, W.N., Krzeminski, Z., Nudds, S.H., and Welch, D.L. *Earth, Moon, and Planets*, Vol. 102, pp. 241-246, 2008.
- [3] Weryk, R.J., Campbell-Brown, M.D., Wiegert, P.A., Brown, P.G., Krzeminski, Z., and Musci, R., *Icarus*, Vol. 225, pp. 614-622, 2013.
- [4] Brown, P.G, Weryk, R.J., Wong, D.K, and Jones, J, *Earth, Moon, and Planets*, Vol. 102, pp. 209-219, 2008.